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COTTON from BOLL to BALE

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U. S. DEPARTMENT OF AGRICULTURE

In Harvesting and Handling Cotton, Remember—

1. Excess moisture, trash, and dirt in the seed cotton reduce the value of the ginned lint.

2. Ginning cotton in a green, damp, or wet condition causes rough preparation and lowers the quality as much as one or two grades. This lowered quality may reduce the market value of the cotton as much as $1 to $10 per bale.

3. Failure of cotton to mature fully as a result of unfavorable weather, insect infestation, and disease damage is responsible for lowering the grade.

4. Undue exposure in the field makes the cotton discolored, dull, and trashy and results in heavy losses to farmers.

5. Rough picking or snapping results in much lower grades than clean hand picking, even when elaborate cleaning machinery is used in ginning.

6. Dry-picked seed cotton gives the best results in ginning. If picked while damp, cotton can be dried artificially at the gin, or it can be dried naturally through proper handling and storing, provided it is not so wet that the seed is soft.

7. Picking cotton as often and as clean as practicable simplifies ginning problems and reduces losses from weathering.

8. Clean picking eliminates much trash and dirt that otherwise would lower the grade of the ginned lint.

9. Proper ginning preserves all the value of the seed cotton that the farmer delivers to the gin. It pays producers, therefore, to insist on good ginning.

10. Care in packing and covering bales at the gins, care in handling the cotton all the way from the gin through the process of recompression, and care in sampling the bales as they pass through marketing channels benefit all branches of the cotton industry from the grower to the person who handles the finished mill product.

11. Extra costs of harvesting and handling to obtain maximum values in ginned lint will, in any case, need to be considered in relation to such increased values as result from following improved practices.

Washington, D. C. Issued October 1941

COTTON FROM BOLL TO BALE

By Francis L. Gerdes, *senior cotton technologist,* and William J. Martin, *associate cotton technologist, Agricultural Marketing Service,* and Charles A. Bennett, *senior mechanical engineer, Bureau of Agricultural Chemistry and Engineering*

The condition in which cotton is brought to the gin is one of the most important factors that determine the grade of the lint and the quality of the ginned seed. Much can be done by the farmers through their methods of harvesting and handling cotton to make farming operations more profitable and to lessen the problems of ginning.

Not all the burden is on farmers, however. Ginners can cooperate by operating their gins properly, by having them adequately equipped, and by keeping them in good repair. To a certain extent, ginners can help their patrons by encouraging the planting of good seed and the use of improved harvesting methods.

If cotton merchants and ginners who buy cotton pay prices, and encourage the payment of prices, that are in line with the quality of cotton bought, they can expect farmers to continue to grow good cotton and to harvest and handle it carefully.

Harvesting

Harvesting is one of the major costs of cotton production, usually amounting to approximately 20 percent of the total. Expenses are high because cotton picking requires a large amount of hand labor, is relatively slow at best, and extends over considerable time. On the average farm, it usually takes about 3 months to gather a crop even if the cotton is picked as the bolls open; and pickers must be kept continually at the job if weather damage is to be kept at a minimum. Unfavorable weather and occasional shortages of labor are real problems in harvesting a crop in high-grade condition.

In the eastern part of the Cotton Belt, tenants supply most of the labor for hoeing and cultivating the crop and for picking as practically all the cotton in this section is hand-picked. With an adequate supply of permanent labor available, the fields are harvested several times during a season. In newer sections of the Cotton Belt, however, much machinery is used on cotton farms, and not much labor is needed before the harvest. There transient workers do most of the picking. But these workers lack the incentive to harvest cotton in good condition, usually working on a weight basis and picking so rapidly and carelessly that the cotton contains an excess of foreign matter. The same situation exists in other areas when regular farm labor is supplemented by temporary help.

Picking Dry or Drying After Picking

Over a large part of the Cotton Belt, too much rain, dew, fog, and high humidity, as well as the practice of harvesting early-season cotton

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in a green and damp condition, increase the problems of moisture in seed cotton. Excess moisture not only causes poor ginning results but also promotes the growth of bacteria and fungi that attack the cotton. These micro-organisms do not stop their destructive work when cotton is ginned, but keep on attacking and discoloring fibers as long as the cotton has a relatively high moisture content. Some of the most destructive organisms do not discolor the lint, and their presence is not known until after considerable damage has been done to the spinning quality of the cotton. Picking the cotton dry or drying damp cotton after picking will retard the growth of such organisms.

Efficient drying and conditioning of moist cotton also improve the grade of the ginned lint. Net gains in favor of drying cotton will frequently range from about 50 cents for a short-staple to approximately $2.00 for long-staple cotton. The problem of excess moisture content due to greenness may be overcome to some extent if green locks of cotton are not harvested with fully opened cotton or if picking operations are not begun too early in the season.

When dews are heavy, seed cotton will generally be too damp for good ginning if picked before 9 or 10 o'clock in the morning. To delay picking until after the dew disappears gives a better grade of cotton. But if dew-laden and dry pickings are placed in the same wagon or cotton house they should be mixed by hand to avoid having a "two-sided" bale. A thorough mixing of such pickings will produce a more uniform grade throughout the bale.

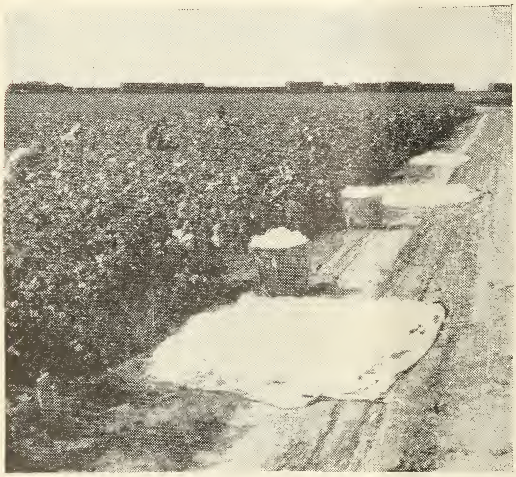
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FIGURE 1.—Sun-drying dew-laden cotton. Spread on big sheets of canvas, the seed cotton will not pick up dirt, ground trash, and soil moisture.

Sun-drying these pickings during the day, only for as long as is necessary to remove the excess moisture, improves the ginning (fig. 1). The damp pickings of early morning should be exposed on tarpaulins or large burlap sheets and gathered sometime later in the day, or at the close of the day in case the cotton needs more extensive drying. Sun-drying green and damp cotton in layers of about 8 inches for at least a few hours, turning it periodically, results in smoother ginning.

Tenants usually pick cotton for several days before accumulating enough for ginning. Substantial grade benefits are obtained when green and damp cotton is stored loosely in shallow piles (2 to 4 feet high) and is adequately turned and aired on cabin galleries, in cotton houses, or in other buildings on the farm. If this is done for about a week during hot dry weather, the helpful effect on grade is comparable with that of field drying of cotton before it is ginned. This method, moreover, has the advantage of eliminating any possible harmful effects on fiber structure and spinning quality from prolonged drying of the material in direct sunlight.

Even with mechanical driers at gins there is danger of the spinning quality of the cotton being adversely affected if too much heat is used in drying. For the usual run of damp or wet cotton, the drying temperature should not exceed 160° F. A slightly higher temperature can be used with very wet cotton, but under no circumstances should it exceed 200° F. The artificial drying process is not designed for completely taking care of extremely wet cotton. Therefore, farmers in their efforts to obtain high-quality lint should avoid picking wet cotton, but if picking it wet cannot be avoided, the cotton should be partly dried on the farm before being taken to the gin. Wet bales are hard to sell except at a discount, which sometimes amounts to $15 or more per bale as compared with the price for cotton ginned in a dry condition.

From the ginner's standpoint, wet seed cotton is undesirable as it causes added wear and tear on his equipment and slows down ginning. Excess moisture in the seed cotton causes chokages in the huller breasts of the gin stands and accumulations of lint between the saw teeth.

Picking Before Undue Field Exposure

Exposure of the open bolls to the weather has long been recognized as a cause of deterioration in the quality of seed cotton. When opened bolls are left in the field, rain, dew, sun, dust, wind, bacteria, and fungi have access to the fibers. Rains, especially when accompanied by winds, cause dust and dirt to get into the cotton, thus reducing its brightness. With prolonged exposure to rains, the color of the cotton takes on a gray or even a bluish cast. Even if little or no rain falls, cotton that is creamy when it first opens will bleach out and become grayer the longer it is exposed in the field. Tests have shown that exposure of the opened bolls for 4 weeks causes an average loss of about one full grade in lint quality. Delayed harvesting of cotton and associated weather damage also impair the germination and milling qualities of the cottonseed.

Clean Picking Desirable

Early in the season when the foliage is green, the only source of leaf trash in seed cotton is the bracts of the bolls. Later on, as the foliage gradually dries out, it becomes increasingly difficult to pick the cotton without including some leaf particles and broken burs. Leaf-worm infestation late in the season also causes additional leaf trash in the exposed bolls.

Clean hand picking involves the removal of the locks from the bolls with a minimum disturbance of the dry leafy bracts. Careful pickers are usually those who have an interest in the crop or who take pride in picking clean cotton, even though the quantity picked within a given time is somewhat less than average. They gather no immature bolls, and they make an effort to shake off or remove clinging leaf particles from the mature locks before putting the locks into the sack. The cotton they pick is almost free from leaf trash (fig. 2). The average type of hand picker, however, works faster, but his cotton generally contains from 1 to 4 percent of foreign matter, mostly leaf trash.

Hand-picked cotton often varies as much as two grades because of the difference in cleanness. Extra care used in picking makes an average difference of a full grade. The loss of two grades, because of careless harvesting can reduce the bale value from $4 to $6 on cotton 1⅛ inches and longer, and as much as $3 on short-staple cotton. The full grade advantage of very clean picking in terms of bale value will often approximate $3 with long-staple and more than $1 with short-staple cotton. Even with the elaborate and extensive present-day cleaning and ginning machinery, it is impossible to produce from roughly harvested seed cotton, lint that is equal in quality to lint ginned from carefully picked cotton. In localities where such cleaning facilities are not available at the gins, even greater care must be taken by farmers to pick their cotton clean and dry.

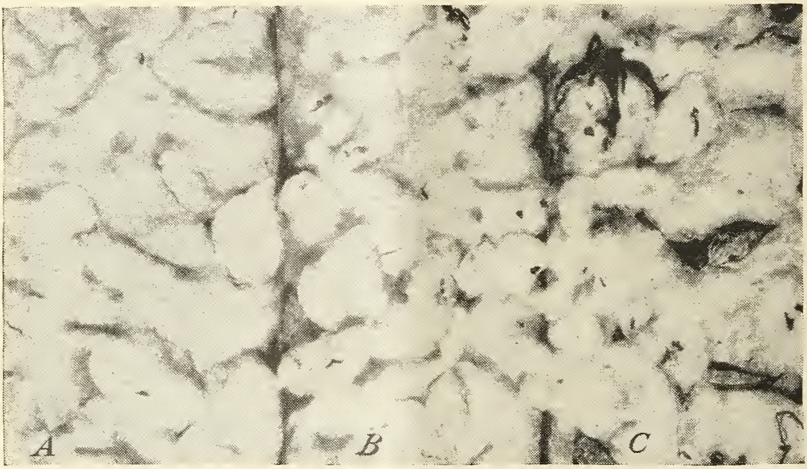

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FIGURE 2.—Seed cotton from the same field: (*A*) picked very clean; (*B*) picked fairly clean, and (*C*) picked trashy. Care in picking can add from $1 to $6 per bale to the value of the ginned lint.

Handling Seed Cotton of Unlike Quality

When cotton is stored on the farm, there is always the possibility that late trashy pickings will be mixed with clean pickings or that damp and dry pickings will be put together. Unless these pickings are ginned separately or thoroughly mixed, the resultant bales are likely to be "mixed-packed." Sometimes mixing can be done at the gin by careful feeding of the unloading suction. Dissimilar lots of cotton in the wagon should be accessible so that small parts of each can be fed alternately at the telescope to produce a fairly uniform bale. These same precautions should be followed by the ginner in ginning remnant cotton of unlike quality.

Farmers should avoid sandwiching trashy cotton between clean cotton in the wagon. Tests show that trash is left in the seed rolls when the "sandwich" is ginned. Even the cleaner seed cotton that is ginned afterward is lowered in grade, and the ginning of clean cotton after trashy cotton produces a "two-sided" bale. Whenever a clean load of seed cotton follows a load of roughly harvested cotton in ginning, the trash-contaminated seed rolls should be removed from the gin stands before the clean cotton is ginned. Otherwise, trash from the roughly harvested cotton will make a plate of low-grade cotton on the bottom of the better bale, and cause it to be penalized in grade.

Standardizing Bale Weights

The wide variation in weights of American cotton bales is presenting serious problems in handling and marketing. Ginners and buyers should encourage producers to bring in loads of seed cotton that will produce bales weighing as nearly 500 pounds as possible. Gin and compress equipment is designed for bales of 500 pounds; and marketing practices and procedures are based on bales of this weight.

Overweight bales are objectionable because they produce difficulties in compressing, and delays and breakdowns at gins and compresses; they are a factor in causing the so-called air-cuts that develop when the bales are compressed; they require extra ties to hold them intact; they are a source of increased damage to bagging because they require extensive use of hooks in handling and unloading for shipment; and they may be rejected under the rules of various trade organizations if they weigh from 650 to 700 pounds. Likewise, underweight bales make it difficult to obtain adequate density for economical shipping; they can be rejected under certain trade rules (they are even subject to cash penalties of from $1 to $5 when they weigh less than 400 pounds); and finally, the combination of two very light bales to make one bale, to prevent rejection, means an extra charge for compress service and the likelihood that mixed-packed bales will result.

Modern Ginning Requirements [1]

Modern gin plants are of all-steel construction, with concrete foundations, floors, and platforms. They are fireproof, conveniently arranged inside and outside, and properly lighted and ventilated. Most gins now have adequate cleaning and extracting equipment. They usually provide for drying green, damp, or wet cotton, either in connection with cleaning and extracting equipment or with separate chambers or towers. Unit cleaner-extractor feeders and huller breasts are standard equipment.

The gins now on the market are of designs that permit loose seed-roll operation with a capacity of at least one bale per hour per 80-saw stand (fig. 3). Saws in modern gins are operated at from 600 to 700 revolutions per minute, as compared with about 400 revolutions per minute for many types of gins manufactured prior to 1930. The higher saw speeds aid in efficient gin operation with loose seed rolls that provide smoother ginning than dense rolls. Reasonable increases in gin saw speeds aid in turning out better prepared lint, cleaner seed, and more fiber from a given quantity of seed cotton. Many gins now in operation can be made to do a better job of ginning by speeding up the gin saws to the range of speeds used in new gins and by repairing or replacing important parts of the gin stands as well as by providing adequate facilities for cleaning and drying cotton.

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[1] For more detailed discussions of better ginning methods, see U. S. Department of Agriculture Leaflets 151, Effects of Feeds and Saw Speeds on Cotton Turn-Out and Quality; 169, Preventing Gin Damage to Cotton; and 181, Drying Seed Cotton.

With the increased production of better cotton during recent years, many ginners, especially those that have installed new gin outfits, have equipped their gins to prevent the mixing of seed. The more commonly employed methods are (1) the blow-pipe vacuum system under the gin, with connection to a fan handling clean air, and (2) the belt system under the gins for feeding pure seed to sacks in the gin house, or to the blow system that carries it to the seed house.

Handling and Storing Baled Cotton

Even after a bale of cotton is rolled from the press, it requires continued care in handling if its value is to be safeguarded. Owners of cotton who do not protect their bales suffer heavy losses each year. Although warehouse facilities for storing cotton normally are adequate in many localities, some farmers do not take advantage of them.

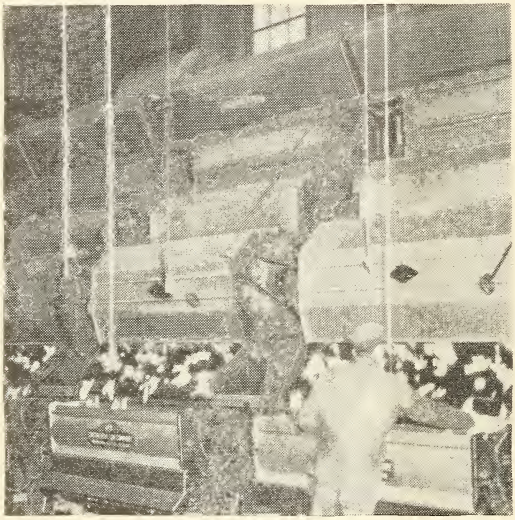

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FIGURE 3.—Interior view of typically modern gin installation. Most new gins have cleaning and drying equipment and operate with loose seed rolls to give smooth ginning. Many older gins can be modernized to do a good job by adding this machinery and by repairing or replacing important parts of the gin stands and speeding up the gin saws to the range of speeds used in new gins.

Cotton sometimes is exposed to dampness or to rainy weather in order to increase its weight. This causes weather damage, and both quality and weight are subject to heavy penalties. Bales stored on the farm need to be under cover and off the ground. If not so protected, they should at least be edged up on poles and turned weekly.

Weather damage to baled cotton may be intensified by the use of cheap second-hand bagging which does not properly protect the lint and which does not withstand abuses in handling and storing. The use of second-hand or inferior bagging, together with weather damage, adds materially to the ragged, unattractive appearance of many bales. Good bagging should be used, and provision should be made to protect all cotton held.

The use of second-hand ties, coated with crankcase oil or other refuse oil or faulty paint should be discouraged. They cause objectionable stains in finished cotton goods.

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